corundum to crystallize. It has also been pointed out in the case of the corundum deposits occurring with dunite in North Carolina that the mineral associates of the corundum are those characteristic of hydrothermal metamorphism.[9] It may be that water at elevated temperatures and pressures can also reverse the trend of the mullite-corundum boundary in systems with magnesia. A few preliminary high-temperature experiments with additions of ferrous oxide, water, or both should demonstrate whether the production of corundum is possible under these simplified composition relationships. The rather constant association of granitic gneiss or clay schist country rock with the corundum that is formed at the borders of basic magnesian rocks can hardly be accidental, and the source of the corundum would logically appear to be the reaction of the intruding and intruded rocks whether or not water vapors or other "mineralizers" take part in this reaction.

These remarks can be summarized briefly. It has been shown that corundum is formed in a glass-melting furnace by the action of a melt containing large amounts of silica and alkalies and considerable lime on an aluminum silicate wall material that approximates dehydrated kaolin in composition and that the formation of corundum under these conditions is explained by the phase relationships in the system $Na_2O$–$Al_2O_3$–$SiO_2$. It is pointed out that the origin of corundum at the contact of syenites and nepheline syenites with aluminum silicate country rocks may be similar and that whether the corundum forms by localized digestion and crystallization from solution or by reaction essentially between the solids is a difference in degree and not in kind. Moreover, the country rocks do not have to be abnormally high in alumina, since in the case of glass tanks, at least, alumina-silica ratios lower than that of kaolin are sufficient to produce corundum by reaction. In the case of the reaction of highly basic magnesian magmas (peridotites and the like) with wall rock the reaction relations are less easy to understand. Nevertheless, the reaction relations must not differ radically from those found in the case of alkaline magmas even though water becomes a necessary agent in the reaction.

[9] E. S. LARSEN, Econ. Geol. 23: 398–433. 1928.

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NOTE: Since this address was delivered, a paper by W. K. Gummer (Journ. Geol. 51: 503–530. 1943) on the system $CaSiO_3$–$CaAl_2Si_2O_8$–$NaAlSiO_4$ shows that crystalline alumina ($\beta Al_2O_3$ in this case) can exist at the liquidus on the join between $NaAlSiO_4$ (nephelite) and $CaAl_2Si_2O_8$ (anorthite) as well as at the liquidus in the ternary system $CaSiO_3$–$NaAlSiO_4$–$CaAl_2Si_2O_8$. The petrologic significance is discussed in the paper.

## BOTANY.—*Irregular barley*, Hordeum irregulare, *sp. nov.*[1]

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One of the types of barley endemic to Abyssinia is best described by a single word, irregular. The late Dr. H. V. Harlan used this term in 1914 (*6*, p. 24) when he stated: "Aside from the observations upon established forms, it has been the fortune of the writer to isolate a number of which there seem to be no published descriptions. These all came from Abyssinian barleys, and as the work is not yet completed, only a general indication of the results need be given here. . . . In barleys received from the same region, there is a group with a curious,

[1] Received February 22, 1945. Cooperative investigations between the Wisconsin Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture. Published with the approval of the Diector of the Wisconsin Agricultural Experiment Station. Supported in part by a Research Grant from the Wisconsin Alumni Research Foundation.

irregular, yet heritable, habit of floret abortion. In the ripened spike the spikelets are normal at the base and for a varying distance toward the tip. The upper portion usually reduces suddenly to a 2-rowed form. In this case the lateral spikelets are not merely sterile, but are reduced to only the outer glumes and the rachilla, the floret having disappeared entirely. The spikes are found to present these modifications even when the head first emerges from the boot. The actual time of the reduction has not been determined but it is so early that no scar is present, indicating that the floret never started to develop."

Harlan continued orally to use the term, irregular barleys, for the type he described in 1914, but unfortunately it never became established in the literature nor came into general use. This is to be regretted, as there is a real need for this term in the barley classification, and especially so since the terms which have gradually come into use instead are confusing and not at all as descriptive as the one Harlan applied.

It appears that the irregular type of Abyssinian barley was collected once by A. F. W. Schimper in the middle of the nineteenth century. It was grown by Al. Braun in the Botanical Garden at Freiburg in 1848, but at that time it was regarded only as a transition form between 6-rowed and 2-rowed barley. This is evident from a statement in "Sitzungsberichte des botanischen Vereins der Provinz Brandenburg" published in 1875 (*12*, p. 437). There it is stated: "Herr Wittmack legte eine grössere Zahl von Schimper in Abyssinien gesammelter Gerstenähren vor, die er theilweise von Herrn Prof. Braun, theilweise von Herrn Dr. Grönland erhalten hatte, und wies an mehreren den Uebergang von 4-zeiliger Gerste[2] in zwei-zeilige nach, ein Uebergang, der bei unseren Culturen sich nie zeigt, aber bei den vom Prof. Braun in Freiburg i/Br. 1848 angestellten Aussaatversuchen der abyssinischen Gersten widerkehrte." The fact that this Abyssinian type appears morphologically to occupy an intermediate position between 6-rowed and 2-rowed barley later undoubtedly led to the use of the term "intermediate" and also to the Latin name *Hordeum intermedium*, although the latter never was intended for that type.

In 1882 Körnicke (*8*, pp. 185–186) described as *Hordeum vulgare* L. subsp. *intermedium* a barley type with awned central florets and awnless lateral ones. The lateral seeds are markedly smaller than the central ones but germinate when seeded. In 1885 Körnicke (*9*, pp. 172–174) gives the same description, only adding that in one of the varieties of the subspecies, var. *Haxtoni* Kcke., not all lateral florets are fertile. The florets are, however, fully developed. In 1916 Carleton (*3*, p. 124) and in 1918 Harlan (*7*, p. 12) used the same description for the species *Hordeum intermedium* Kcke. Harlan's description of *Hordeum intermedium* in 1918 does not include the irregular type of Abyssinian barley that he discussed in 1914. The first time this type is again mentioned in the literature is by Engledow in 1924. Previous to that date it was discussed in correspondence between Harlan and Engledow.[3] Judged from a letter to Harlan on January 29, 1921, Engledow had found the irregular type among Abyssinian barleys in 1920. From Harlan's reply on February 23, 1921, it is clear that Harlan, at that time, knew about the variations in irregular barleys from the type with occasional lateral seeds to those with practically all lateral seeds fully developed, but he did not classify them with any other group of barleys. Engledow's description in 1924 places the irregular barleys as exceptional forms of *Hordeum hexastichum* or *Hordeum decipiens*. He placed them with *Hordeum hexastichum*, when an occasional lateral floret was missing, and with *Hordeum decipiens*, when many of the lateral florets were missing. In regard to the stability of the character he points out (*4*, p. 58), that "in three successive seasons this peculiarity has been maintained and it is, therefore, to be regarded as a constant and heritable attribute."

Körnicke's description of *Hordeum vulgare* L. subsp. *intermedium* remained valid and was applied only to the type of barley

[2] The "4-zeilige Gerste" in the early literature is equivalent to the 6-rowed barley of the present-day literature.

[3] Correspondence between Harlan and Engledow filed in National Archives, Washington, D.C.


FIG. 1.—Spikes of irregular barley, *Hordeum irregulare* E. Åberg and Wiebe, of Abyssinian origin showing the variation found in number of missing lateral florets. *A*, Many lateral kernels missing (C. I. 5843); *B*, some lateral kernels missing (C. I. 3210–5); *C*, occasional lateral kernels missing (C. I. 1238).